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Sustainability of the Peruvian public debt and its effect on economic growth in the period 2000-2021

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ABSTRACT

The objective of this research was to evaluate the effects of public debt sustainability on economic growth in the period 2000-2021 and establish a new optimal debt level that does not affect Peru's economic growth. The general method used to determine this effect was the hypothetical deductive method with a non-experimental and longitudinal trend design, because the data to be analyzed are variations that have occurred over time; the VAR (vector autoregressive) model was used as a specific method, because the evidence was insufficient to consider the simultaneity between the reactions of the variables to propose an SVAR model. Data were collected from economic portals such as the Ministry of Economy and Finance (MEF), as well as the Central Reserve Bank of Peru (BCRP). The estimated sample size was 88 observations representing all quarters from 2000 to 2021. As a result of the econometric regression, the impact of the level of public debt on economic growth is positive, since a one-unit increase in the percentage of public debt will increase the variation of GDP by almost 1.1%. Regarding the debt level forecast and according to the projection made, it was determined that the new debt level that does not affect the sustainability of public finances or the long-term economic growth of the Peruvian economy should be 38% of GDP.

1. Introduction

Public debt sustainability is generally based on a country's ability to meet all current and future payment obligations, if it is unable to meet its obligations, it will be required to restructure the debt, facing higher borrowing costs, harming growth and investment. According to Jiménez (2003), by an increase in the public debt, the government also needs to increase future primary surpluses to cope with any possible intertemporal budget constraint. A primary surplus can be achieved by increasing taxes or reducing public spending. The importance of the sustainability of fiscal policy and the, therefore, public debt, is that its analysis can determine the economic policy measures to be taken by the government to achieve macroeconomic stability, also "The rapid accumulation of public debt in an environment of financial instability and low growth has made it more necessary to assess the evolution, size and sustainability of public debt" (European Central Bank, 2012). In order not to create a vicious circle of increasing debt and slow growth that tends to perpetuate itself (Álvarez Texocotitla, Álvarez Hernández, & Álvarez Hernádez, 2017).

After World War II, particularly during the 1970s, political-economic principles had been largely dominated by the Keynesian approach, generating an increase in public debt in European countries, which was even higher than the gross domestic product (GDP) growth rate, so the relationship between these variables grew. Even in the euro zone signed the Maastricht treaty that states that the public deficit should not exceed 3% and public debt should not exceed 60%, several economies have difficulties with their debt service and some have even had to be rescued by the European Stability

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Mechanism to avoid bankruptcy. This development led (Hamilton & Flavin, 1986) to initiate modern empirical research that analyzed the sustainability of a time series of the U.S. government's public debt from 1960-1980.

These debt-related economic difficulties were also present in Latin American countries and other regions. For example, the financial crisis in Mexico in 1982 was caused by external over-indebtedness and in several Latin American countries a public debt crisis was generated, this event is known as the "lost decade", the Brady Plan strategy, which aimed to restructure the debt contracted by developing countries with bonds backed by the U.S. Treasury, was implemented at the beginning of the 1980s and concluded at the end of 1989, the company is characterized by relatively inexpensive financing, which led to an improvement in external viability.

Although many Latin American countries tried to reduce their debt at the beginning of the 1990s, this trend was abruptly interrupted in 1998 due to high interest rates and exchange rate hikes, generating an explosive dynamic of debt growth, which absorbed a significant proportion of fiscal revenues, affecting the fiscal budget of Latin American countries. This led to the Russian default (1998), Ecuador's default (1999), Argentina's default (2002) and Uruguay's debt restructuring (2002).

Peru has experienced a long period of fiscal deficits and low fiscal credibility in the 1980s, which is why in 1999 the first macro-fiscal framework was established, currently known as the Framework for Fiscal Responsibility and Transparency, accompanied by a monetary policy that allowed Peru to achieve high growth rates and low volatility of the gross domestic product (GDP) to accumulate fiscal surpluses, which will serve to cover periods of moderate fiscal deficits. This fiscal soundness built over two decades, allows the country to implement a broad set of policies and measures, as well as the deployment of necessary resources, to cope with adverse shocks and times of crisis; such as the international crisis between 2008-2009 due and the COVID-19 pandemic between 2019 - 2021.

On the other hand, Surco (2018) concluded that the gross public debt of the non-financial public sector (NFPS) had a positive effect for the Peruvian economy for the years 2001 - 2016, that is, an increase in the Public Debt could increase the long-term growth rate, justified in the increase of public investment financed by debt and in the issuance of bonds, with the purpose of developing the capital market.

According to Mendoza et al. (2021) in the 2000-2019 period, the structural fiscal rule increased consumer welfare, reducing the procyclicality of public investment in the face of commodity price shocks and volatility in the face of interest rate shocks; this rule also has a lower probability of exceeding the current public debt limit of 30% of GDP, although there is a trade-off between investment-friendly rules and fiscal sustainability.

Considering that public debt sustainability is a necessary aspect for macroeconomic stability, the research proposes to evaluate the effects of public debt sustainability on economic growth in the period 2000-2021 and to establish the new optimal debt level that does not affect economic growth in Peru.

2. Literary Review

2.1 Economic growth

Bannock and Rees (2007) define economic growth as “a constant process of increases in the productive capacity of the economy and, therefore, in the National Income”. This is represented by a rate in relation to the gross domestic product (GDP) of a country in a given period. The economic growth rate is defined by the Central Reserve Bank of Peru (2019) as “Percentage variation of production (measured by real growth domestic product (GDP)) in a given period”.

2.2 Public Debt

Public debt is the set of outstanding obligations that the public sector has at a given date with its creditors. It is a way of obtaining financial resources from the state or any public authority and is normally materialized through the issuance of securities in local or international markets, through direct loans from entities such as multilateral organizations, governments, etc. (Ministry of Economy and Finance, 2020). There are two types of debt: domestic debt, which is the amount of obligations contracted with economic agents resident in the country, and external debt, which is the debt contracted with economic agents not resident in the country. The sustainability of public debt concerns stability and long-term economic growth (p.48), to consider the “level of public debt as sustainable, a long-term growth rate for Gross Domestic Product is required” (López & Castañeda, 2008).

2.3 Tax rules

Kopits and Symansky (1998) mention that a fiscal rule is a permanent constraint on fiscal policy, typically expressed through indicators of overall fiscal performance. Fiscal rules affect variables such as the budget balance, borrowing, the level of debt or some component of debt. It is often expressed in numerical or objective terms as a proportion of the GDP. In other

words, fiscal rules specify a type of limit on fiscal variables, which are used to reduce the degree of fiscal policy discretion in order to reduce fiscal deficits to maintain and achieve fiscal sustainability.

Pereya Ayala (2002) mentions that the primary intent of the application of a fiscal rule is to ensure responsible behavior within a path that contributes to the pursuit of economic stability. However, according to Wyplosz (2012), "Fiscal rules may be vulnerable to intertemporal inconsistency, in the face of unpredictable events, they may become inoperative or limit fiscal policy responses to adverse shocks".

In 1999, the Fiscal Prudence and Transparency Law (Law No. 27245) was enacted; however, the law lacked clear fiscal rules, so they were modified 3 times, the last modification was in 2016, through D.L. N° 1276; called "Framework for Fiscal Responsibility and Transparency of the Non-Financial Public System", it has more specific fiscal rules, highlighting; the total gross debt must not exceed 30% of GDP and the annual fiscal deficit must not exceed 1% of GDP.

Additionally, the development of a yield curve allowed the expansion of the capital market in soles, which made it possible for public debt to present acceptable risks and for the maturity of bonds in soles to increase significantly from 10 to 40 years; thus, in July 2014, a new bond was issued with maturity in 2055. The immediate effect of this event improved Peru's credit position in the international market, evolving significantly since then until reaching a rating in 2020 of BBB+ in foreign currency and A- in local currency; in addition to maintaining a stable outlook, reflecting the fiscal balances; however, the Ministry of Economy and Finance authorized the suspension of the fiscal rules for the years 2020 and 2021 on a temporary and exceptional basis, in order to minimize the negative effect of the pandemic on the Peruvian economy.

Fig. 1. Risk rating of sovereign debt in local currency 2000 - 2020

Note: Prepared by the Company: Moody's, S&P, and Fitch.

2.4 Public debt to GDP ratio

Economic theory argues that public debt is a means to stimulate aggregate demand, which would have a positive economic growth effect in the short term; however, it crowds out private investment and significantly reduces economic performance in the long run (Elmendorf & Mankiw, 1999). And, if long-term interest rates rise, then an increase in public debt could therefore crowd out investment (Modigliani, 1961) (Baldacci & Kumar, 2010). The other way in which public debt would have a negative effect on long-term economic growth is that, given a substantial increase in public debt, the government would have the possibility of financing the debt through future tax increases, which will considerably reduce potential economic growth in the future. Thus, Aghion and Kharroubi (2007) mentions that high public debt figures will reduce the ability to implement countercyclical fiscal policies, causing increased volatility and reduced economic growth.

There is ample evidence that suggests the relationship between public debt and economic growth, among the most notable are:

Reinhart and Rogoff (2009) found findings that show that those industrialized countries whose debt is less than 30% of GDP, have an average GDP growth of 2.6% more than those that have a debt that exceeds 90% of their GDP, while that for emerging markets with low debt (less than 30%) they have an average growth of 2.1% with those that exceed the threshold of 90% of GDP. Kumar and Woo (2010), who studied the impact that initial public debt could have on economic growth for both advanced economies and emerging markets during the periods 1970 - 2007. Their results showed that there is indeed an inverse relationship between initial debt and future economic growth, being the emerging economies, whose impact on economic growth is much more marked.

Checherita and Rother (2010) showed that there is an inverted u-shaped relationship between public debt and economic growth, whose turning point occurs around 90-100% of GDP; that is, a public debt whose range oscillates between those mentioned, will result in lower levels of economic growth. In addition, it warns that the transmission channels through debt

that harm growth are private savings, sovereign debt, public investment, long-term nominal and real interest rates. Cecchetti, Mohanty and Zampolli (2011) analyzed that economic growth is affected when government debt is between 85% of GDP and that governments should aim to control and maintain debt levels below estimates.

Calderón and Fuentes (2013), finds evidence of the relationship between public debt and economic growth for 136 countries. The panel data methodology for the years 1970-2010 shows a negative relationship between public debt and economic growth. It highlights that the reduction of both the public debt and the improvement in the political environment will result in an increase in the per capita growth rate of 1.7% for the Caribbean and 2% for South America. Égert (2015) subjected a set of data to econometric analysis to corroborate whether public debt has a non-linear and negative effect on economic growth if the debt exceeds the threshold of 90% of GDP. They showed that only at levels of 20% to 60% can the presence of a negative non-linear effect be observed; however, at higher levels, there is no evidence of the threshold mentioned by Reinhart and Rogoff of 90%.

3. Hypothesis

3.1 General hypothesis

The effect of public debt on economic growth over the period 2000 - 2021 has been significant.

Specific hypothesis

H_1: The evolution of public debt in the period 2000 - 2021 has been influenced by institutional factors (credit rating, fiscal rules) and structural factors (primary surplus, GDP growth).

H_2: The optimal level of debt that does not affect Peru's economic growth is less than 40% to GDP.

4. Methodology

4.1 Population and sample

The approach has a quantitative perspective, because of its basis of numerical measurement to test the hypothesis; it is a basic applied type and it presents an explanatory level of study, since its purpose is to answer causes (post facto research), and effects (experimental research), because the economic theory is analyzed with the purpose of establishing behavioral processes and testing theories in the national reality, with the use of contrasted data; the method applied is hypothetical-deductive with a non-experimental and longitudinal design of trend, because the data to be analyzed are variations or changes over time, in this design there is no manipulation of variables. A sample size of 88 observations was estimated, representing all the quarters considered for the 2000-2021 study period, sufficient data to be subjected to statistical and econometric tests.

4.2 Data collection instrument

This research used a set of data collected from economic portals such as the Ministry of Economy and Finance and the Central Reserve Bank of Peru, the data sets will be taken in a certain period of analysis on an annual basis, from 2000 to 2020.

4.3 Econometric Model

Model VAR

It is a simultaneous equation model formed by a system of equations of unrestricted reduced form and is expressed as follows:

$$Y_t = \sum_{i=1}^{P_1} AY_{t-i} \; + \; + \; \sum_{i=1}^{P_2} \gamma d_{t-i} + \; u_t$$

$$Y_t = \begin{pmatrix} pb_t \\ g_t \\ \pi_t \\ i_t^n \\ i_t^x \end{pmatrix}$$

where:

pb_t : *Primary income as a percentage of GDP*

g_t : *GDP growth rate*

π_t : *Inflation*

i_t^n : *Implicit interest rate of domestic public debt (Local currency)*

i_t^x : *Implicit interest rate of external public debt (Foreign currency)*

d_{t-i} : *Public debt as a percentage of GDP*

A : *Matrix of coefficients*

u_t : *Well-behaved error terms*

All variables defined in Y_t are part of the simple debt accumulation equation.

4.4 Model Specification

A VAR model was considered, since there was insufficient evidence to consider simultaneity between the reactions of the variables and to propose a SVAR model. In addition, by using first differences, integrated series of order one are avoided and, consequently, possible VEC models are also avoided. Therefore, the econometric model would be presented as follows:

$$Y_t = B_O + B_1 Y_{t-1} + B_2 Y_{t-2} + B_3 Y_{t-3} + \varepsilon_t$$

where:

B_O = Intercept matrix

B_1, B_2, B_3 = Matrices pending

The variable Y_t is a stochastic variable that represents all the variables taken into account for the present research.

$$Y_t = (g, pb, pi, ratio, d)$$

g : GDP variation rate

pb : Average primary issuance

pi : CPI variation (inflation proxy variable)

ratio : Ratio of domestic and external non-financial public debt balance

d : Non-financial public debt balance as a percentage of GDP

5. Results

5.1 Description of variables

The variables in time series have been obtained from the statistics section of the official website of the Central Reserve Bank of Peru, for the period 2000 to 2021, on a quarterly basis. Table 1 shows the central tendency and dispersion statistics of the variables.

Table 1
Descriptive Analysis – Summary

Statitic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
g	88	4.537	6.450	-29.940	2.716	6.472	41.879
pb	88	15.340	15.225	-11.541	5.375	25.017	60.348
pi	88	0.479	0.533	-0.660	0.078	0.790	1.958
ratio	88	0.837	0.539	0.246	0.308	1.098	2.142
d	88	31.282	10.089	18.067	23.007	41.591	50.316

It can be seen that they all have 88 observations representing all the quarters considered for the study period. GDP growth (real percentage variations) has had a mean of 4.5 %, and a deviation of 6.45 (which implies a variation coefficient of

142.15, which is quite large). However, for the particular case of the debt percentage, we have a mean of 32% and a deviation of 10.7, which would result in a coefficient of variation of 34.16, the lowest of all the variables.

Table 2
Correlation matrix – summary

	g	pb	pi	ratio	d
g	1				
pb	0.292	1			
pi	0.221	0.220	1		
ratio	-0.237	-0.194	0.018	1	
d	-0.011	-0.015	-0.103	-0.663	1

Table 2 shows the correlations between the variables. All of them are moderately correlated except for the variables "ratio" and "d", which have a negative correlation of 0.66. This could increase the variance of the parameter estimates when doing the econometric modeling, since this is conceived to a possible linear combination between them. Fig. 2 shows the frequency plot of the data for each variable (histogram), and the scatter plot of the interaction between them by means of the correlation matrix.

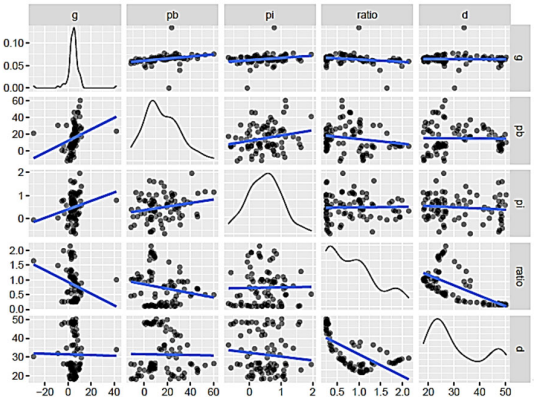

Fig. 1. Correlation and distribution

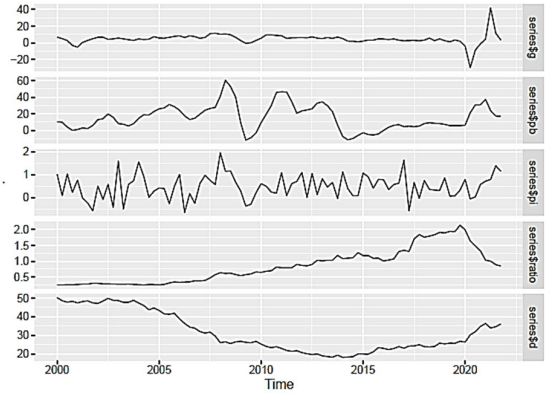

Fig. 2. Plot time series

5.2 Unit root test

Fig. 3 shows the temporal behavior of the variables. All seems to have a stable behavior over time, except the variables "ratio" and "d" which have a definite trend. Possibly this relationship is what caused an inverse correlation in their descriptive analysis. When performing the Augmented Dickey Fuller unit root tests, shown in Table 3, it is observed that the only integrated variables of order one are precisely "ratio" and "d". Confirming that both variables are I(1), the Granger Causality test was performed and it was found that both are significantly Granger Causal (p-value of less than 5%).

Table 3
Aumented Dickey – Fuller Unit Root Test

Series	Statistic (tau)	Cri. Val (0.01)	Cri. Val (0.05)	Cri. Val (0.10)
G	-3.833	-2.6	-1.95	-1.61
Pb	-3.126	-2.6	-1.95	-1.61
Pi	-2.606	-2.6	-1.95	-1.61
Ratio	-0.279	-2.6	-5.4	-4.76
D	0.967	-4.04	-1.95	-1.61

Table 4
Granger Causality Test

Y	X	Statistic	P-value
Ratio	D	7.0915	0.0093
d	Ratio	12.104	0.0008

Table 5
Aumented Dickey-Fuller Unit Root Test- 1st difference

Series	Statistic (tau)	Cri. Val (0.01)	Cri. Val (0.05)	Cri. Val (0.10)
g	-7.726	-2.6	-1.95	-1.61
pb	-5.694	-2.6	-1.95	-1.61
pi	-9.499	-2.6	-1.95	-1.61
ratio	-4.994	-2.6	-1.95	-1.61
d	-5.325	-2.6	-1.95	-1.61

However, to avoid problems with some variables being integrated of order one and others not, we have chosen to work with all the variables in first differences. Thus, simplified by using a simple autoregressive vector model. By performing again the Augmented Dickey-Fuller unit root tests, it can be observed that the statistic is greater than the critical one at 95% confidence. Therefore, we reject the null hypothesis that the series have unit root and that they are integrated of order one, I(1), and accept the alternative hypothesis that all variables are stationary.

Table 6
Information Criteria Lag Selection

	1 Lag	2 Lag	3 Lag	Selection
AIC(n)	1.770	1.761	1.736	3
HQ(n)	2.061	2.343	2.609	1
SC(n)	2.494	3.208	3.906	1
FPE(n)	5.875	5.854	5.786	3

By means of the information criteria used: Akaike, Hannan-Quinn, Bayes-Schwarz and the final prediction error, shown in Table 6, it was decided to use a three-lag VAR model, the results are shown in Table 7.

Table 7
VAR Model Result

	Dependent variable:				
	g	pb	y pi	ratio	d
	(1)	(2)	(3)	(4)	(5)
g.l1	-0.213 (0.144)	-0.088 (1.140)	0.014 (0.013)	0.004 (0.002)	-0.035 (0.028)
pb.l1	0.391*** (0.124)	0.688*** (0.120)	0.011 (0.011)	0.002 (0.002)	-0.010 (0.024)
pi.l1	-0.920 (1.327)	0.325 (1.283)	-0.827*** (0.115)	-0.663 (0.019)	1 (0.261)
ratio.l1	-11.066 (8.502)	4.713 (8.217)	0.729 (0.736)	0.168 (0.122)	-1.986 (1.672)
d.l1	0.848 (0.661)	-1.408*** (0.639)	0.054 (0.057)	-0.003 (0.009)	0.131 (0.130)
g.l2	-0.184 (0.160)	0.203 (0.155)	0.030*** (0.014)	0.001 (0.002)	-0.060* (0.031)
pb.l2	-0.224 (0.163)	-0.043 (1.675)	0.019 (0.150)	-0.004 (0.025)	0.023 (0.341)
pi.l2	-1.216 (1.733)	-1.426 (1.675)	-0.468*** (0.150)	-0.017 (0.025)	-0.197 (0.341)
ratio.l2	-11.253 (8.860)	0.457 (8.563)	-0.432 (0.767)	0.115 (0.127)	0.664 (1.742)
d.l2	0.728 (0.662)	0.387 (0.640)	0.051 (0.057)	-0.006 (0.010)	-0.089 (0.130)
g.l3	0.139 (0.170)	-0.329** (0.164)	0.021 (0.015)	0.001 (0.002)	-0.043 (0.033)
pb.l3	0.124 (0.126)	-0.293** (0.122)	-0.021* (0.011)	0.001 (0.002)	-0.010 (0.025)
pi.l3	-0.267 (1.384)	-1.216 (1.338)	-0.396*** (0.120)	0.036* (0.020)	0.398 (0.272)
ratio.l3	2.481 (9.343)	-1.703 (9.030)	-0.057 (0.809)	0.144 (0.134)	-3.196* (1.837)
d.l3	0.044 (0.647)	0.491 (0.625)	-0.053 (0.056)	-0.013 (0.009)	0.290** (0.127)
Const	0.561 (0.693)	0.014 (0.670)	0.012 (0.060)	-0.001 (0.010)	-0.020 (0.136)
Observations	84	84	84	84	84
R^2	0.348	0.510	0.596	0.309	0.284
Adjusted R^2	0.205	0.402	0.507	0.156	0.126
Residual Std. Error (df = 68)	6.113	5.908	0.529	0.088	1.202
F Statistic (df = 15;68)	2.424***	4.71p6***	6.695***	2.026**	1.798*
Note:			*p<0.1;	**p<0.05;	***p<0.01

Table 8 analyzes the assumptions on the errors of the econometric model: normality, serial correlation and heteroscedasticity. It can be seen that all the assumptions except for the normality of the errors, are exceeded.

Table 8
Model Assumption Test

Assumption	Test	Statistic	P-value
Normality	JK-Test (multivariate)	560.9094	0
Autocorrelation	Portmanteau Test (asymptotic)	309.404	0.7243
Heteroskedasticity	ARCH (multivariate)	1144.3326	0.3375

6. Econometric Model Results

6.1 Impact of debt level on economic growth

Fig. 4 shows the impulse and response function of the debt level to economic growth. A positive impact of one percentage unit of public debt will cause an increase in the change in GDP (economic growth) by almost one percent. Then, in the following periods, we observe cycles in which growth falls back to zero and then grows again at a lower and lower rate, and so on, until it returns to a zero percent growth rate, which would explain the long-term economic growth or steady state. In summary, an increase in public debt as a percentage of GDP has a positive, cyclical, short-term impact on economic growth.

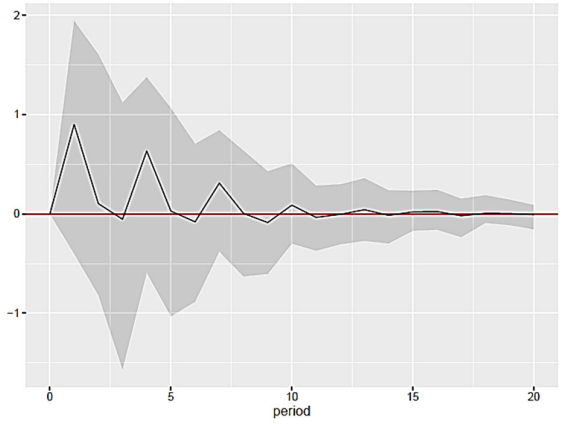

Fig. 3. Impulse-response function d to g

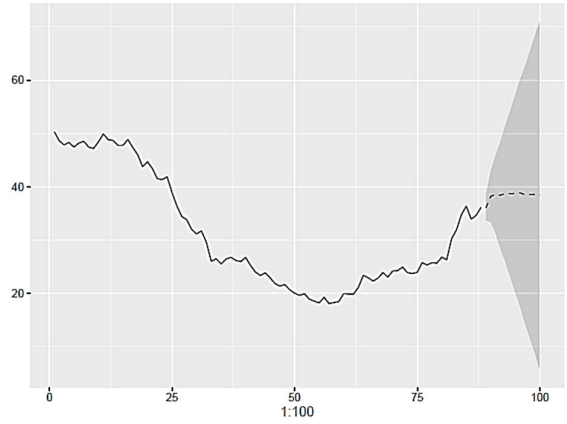

Fig. 4. Public debt forecast

6.2 Debt level forecast

As regards the forecast of the debt level as a percentage of GDP, and Fig. 5 and the numerical values in Table 9 are presented. Although it can be seen that the debt percentage is expected to reach 38%, the graph shows that the values included in the 95% confidence interval indicate that the debt level could reach much higher values, or at least above 40%. In fact, the forecast shows that as we move forward in successive periods (that is, in the following quarters of the years 2022 to 2024) the debt level exceeds 60% of GDP. It should be remembered that although it is not known what will happen in the future and that this econometric calculation is based on assumptions: context and other fixed variables (ceteris paribus), the debt decision is state policy.

Table 9
Public debt as percent of GDP

	Qtr1	Qtr2	Qtr3	Qtr4
2022	36,023	38,193	38,573	38,401
2023	38,766	38,658	38,714	38,837
2024	38,467	38,504	38,547	38,338

7. Contrasting Results

After estimating the VAR model to determine the effect of public debt on economic growth in the period 2000-2021, the hypothesis will be reviewed:

General hypothesis: The effect of public debt on economic growth in the period 2000-2021 has been significant. According to the results obtained, “d” (balance of non-financial public debt as a percentage of GDP) has a positive, short-term cyclical impact in relation to “g” (economic growth). Thus validating the general hypothesis.

- Specific hypothesis 1: The evolution of public debt in the period 2000-2021 has been influenced by institutional and structural factors. According to the results obtained, “pb” (primary result as a percentage of gdp) and “pi” (variation of the consumer price index) have a positive effect on “g” (economic growth), which validates the hypothesis.
- Specific hypothesis 2: The optimal level of debt that does not affect Peru's economic growth is less than 40%. According to the results obtained and considering the fixed variables (ceteris paribus), a debt level of 38% of GDP in relation to “g” was predicted, being less than 40%, which validates the hypothesis.

In summary, the general hypothesis was highly contrasted by the VAR model shown in the previous section, where it is observed that public debt has a significant impact on economic growth during the 2000-2021 period. With respect to specific hypothesis 1, the evolution of public debt in the 2000-2021 period has been influenced by institutional and structural factors. With respect to hypothesis 2, the optimal level of debt that does not affect Peru's economic growth is less than 40% of GDP.

8. Discussion and conclusion

The result obtained in the econometric VAR model for the first hypothesis shows that a positive impact of one unit of measure of the percentage of public debt will cause an increase in the variation of GDP (economic growth) by almost one percent. In other words, the level of debt does have a positive, cyclical and short-term impact on economic growth. These results have a similarity with those mentioned by Pescaroti et al. (2014) Where evidence that the relationship between debt level and growth is significantly influenced by the debt trajectory. Moreover, countries with high but declining debt levels have historically grown as fast as their neighboring countries. However, volatile growth can be detrimental to economic welfare, so it is important to keep in mind that the financing policy does not end with financing alone, but a good spending policy is also of vital importance, being useful for the subsequent establishment of policies and other tools, as well as a contribution to the generation of proposals for structural change that allow for an improvement in the fiscal and macroeconomic conditions of the country.

Regarding the debt level forecast for the following years, according to the data and the methodology used, it can be observed that the new sustainable debt level of public finances that does not affect long-term economic growth for the Peruvian economy should be 38% of GDP. This result contrasts with Mendoza et al. (2021), who after analyzing structural factors determined that Peru has the lowest probability of exceeding the public debt limit of 30% of GDP. However, the result obtained in the present research agrees with that issued by the International Monetary Fund (2021) and the World Bank, who classify countries in three categories of debt tolerance capacity; weak, medium and strong, in order to be considered sustainable debt should not exceed 30%, 40%, and 50% respectively. Since, according to the results obtained, the level of debt can increase significantly up to 40% of GDP and reach record levels exceeding 60% of GDP. To deliberately mention that having a high debt would be a problem in the future would be a mistake; but as mentioned before, good public spending policies must be in place to adequately stimulate growth as well as economic development.

Reinhart and Rogoff (2009), in their research they concluded that economic growth slows considerably (from 3% to less than 2%) if the public debt/GDP ratio exceeds 90% and by 2 percentage points per year for emerging market economies such as Peru. However, Herndon et al. (2013) contradicted their results, asserting that economic growth does not decline when public debt levels exceed the 90% threshold. As can be seen, the investigations show a marked difference between each type of analysis shown by the authors. Given this, Égert (2015), carried out a comparison of results using the same methodology proposed by the first-mentioned authors, the remarkable thing about their research was that they wanted to estimate whether public debt has a negative non-linear effect if it exceeds the limits proposed by Reinhart and Rogoff of 90% of GDP. They showed that only at levels of 20% to 60% can the presence of a negative non-linear effect be observed; however, at higher levels, there is no evidence of what Reinhart and Rogoff mentioned. Contrasting the previous evidence, the result of this investigation was that the debt limit for the Peruvian economy should be 38%, since passing this threshold would affect finances and national accounts. This much more comprehensive debt limit may be due in the first instance to the data as well as country applicability. Being that the authors mentioned analyzed annual data for a set of countries, while the present investigation focuses only on the economy of Peru, known as an emerging market.

Recent research shows that the evidence of non-linearity with respect to the relationship between debt and growth differs greatly according to the level of debt and the economic situation of the country in question. For example, for advanced countries, a low level of debt is positively related to economic growth; In other words, if the level of debt increases, so will economic growth, as long as the public debt finances public investment projects that return high returns, which will increase long-term economic growth.

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